stress echocardiography (Dob) (5 and 10 μ/kg/min). Aortic distensibility was evaluated using Peterson's pressure strain modulus (Ep). Ep was estimated from M-Mode derived diameter changes (dD/D) of the ascending aorta and the pulse pressure (PP) from simultaneous brachial artery blood pressure (BP): $Ep = PP*D/dD(dyn*cm^{-2})$. Stroke volume (SV) was calculated with pulsed Doppler. Peripheral resistance (PVR) was calculated as the ratio of mean BP/SV. Measurements were obtained at rest (R) and after Dob.

Overall heart rate and systolic BP showed minimal increases (%: 10 ± 4 and 6 ± 5 respectively). The changes of Ep were as follows:

	Normals	1VD	2VD	3VD
R	0.45 ± 1.1	0.53 ± 1.2	0.55 ± 0.7	0.56 ± 0.7
Dob	0.49 ± 0.6	0.52 ± 0.7	0.61 ± 0.6	1.28 ± 0.9*

*p < 0.05 vrs 3VD-R and all Dob

Aortic distensibility was similar at R between all groups. In contrast it was decreased in 3-VD pts at Dob.

From R to Dob the % increase of SV was 7 ± 4 and the % decrease of PVR was 1.6 ± 2.4. The % changes of SV had a strong inverse relationship with PVR (r = 0.86, p = 0.0001). When the % changes from R to Dob were considered, Ep had only a weak relationship to SV (r = 0.30, p = 0.08) but a stronger inverse one to PVR (r = −0.49, p = 0.001).

In conclusion, the extent of CAD may be related better to the dynamic elastic properties of the ascending aorta than values obtained at rest. Dynamic changes of aortic distensibility can only partially be attributed to stroke volume changes. During dobutamine infusion the decrease of ascending aorta distensibility is counterbalanced by the lowering of the peripheral resistance. Thus aortic impedance tends to be stable in order to optimise ventriculoarterial coupling.

950 Three-Dimensional Echocardiography

Tuesday, March 26, 1996, 9:00 a.m.–11:00 a.m.
Orange County Convention Center, Hall E
Presentation Hour: 9:00 a.m.–10:00 a.m.

950-69 Three-Dimensional Dynamic Reconstruction of the Descending Thoracic Aorta From Transesophageal Echocardiographic Images Using Acoustic Quantification

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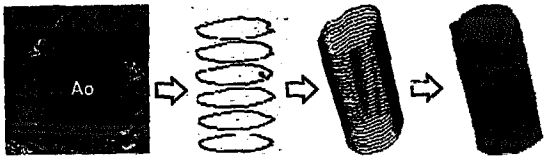
Acoustic quantification (AQ) is a real-time echocardiographic technique which provides automated border detection of the blood-tissue interface. We used AQ images of the descending thoracic aorta as a basis for dynamic three-dimensional (3D) reconstruction. Images were acquired in 5 subjects undergoing transesophageal (TEE) examinations (HP SONOS 2500). Manual withdrawal of the TEE probe in 2 cm steps was used to obtain images of the descending aorta at 6 different levels. At each level, following optimization of gain settings for automated tracking of the aortic wall, images were acquired throughout the cardiac cycle. Image sequences were digitally stored and analyzed off-line on a frame-by-frame basis using custom software. The analysis consisted of: (1) extraction of boundary pixel coordinates, (2) definition of aortic wall contours, (3) 3D surface computation and rendering, and (4) integrated dynamic display of the pulsating aorta. *Results.* In all subjects, the pulsatile motion of the aortic surface was clearly visualized. Reconstruction time for one data set was approximately 5 min.



Conclusion. Due to the fully automated and real-time character of AQ border detection, this technique provides an excellent basis for fast 3D imaging of the aorta.

950-70 Three-Dimensional Echocardiographic Acquisition and Two-Dimensional Display of the Left and Right Coronary Arteries

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Transthoracic three-dimensional (3D) acquisition of the proximal left coronary artery (LCA) using a rotational scan has been previously described by our laboratory. The purpose of this study was to use 3D acquisition with a fan-type scan to reconstruct and display two-dimensional segments of the LCA and right coronary artery (RCA). Eighteen adult subjects with angiographic coronary artery disease, 6 with normal coronary angiograms, and 3 normal volunteers were studied. Scans were performed using a 3–5 MHz phased array transducer interfaced with a TomTec computer. From a high parasternal position in long-axis orientation, the LCA was acquired by scanning laterally (all 27 studies) and the RCA by scanning medially (7 studies) at ≈0.5 degree intervals over ≈40 degrees. Following post processing, a cut plane was positioned perpendicular to the left main (LM) coronary artery, and moved laterally with minor adjustments in angulation to optimize display of the LCA. In all patients, part of the LCA was visualized. The LM was seen in cross-section in 85%. Longitudinal views of the proximal left anterior descending (LAD), circumflex and mid-LAD were seen in 52, 67, and 70%. In the 7 RCA studies, a longitudinal view of the proximal RCA was visible arising from the aorta in 6. By moving the cut plane medially, the RCA was followed into the atrioventricular groove in 6. *We conclude:* 1) 3D acquisition of the LCA and RCA is possible using a fan-type scan. 2) Segments well beyond the proximal portion of the vessels were identified. 3) The proximal LAD was not visualized as well as more distal portions of the artery.

950-71 Evaluation of Left Ventricular Systolic Function in Hypertensive Heart Disease and Hypertrophic Cardiomyopathy by Transesophageal 3-D Reconstruction

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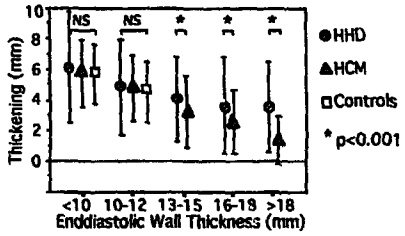
Systolic function of the hypertrophied left ventricle (LV) in patients with hypertensive heart disease (HHD) and hypertrophic cardiomyopathy (HCM) has been incompletely characterized by 2-D echo. Thus, multiplane transesophageal echocardiography with 3-D reconstruction (TomTec) of cross-sectional images was used. In each of 10 patients with HHD, 10 with HCM, and 10 healthy controls, five parallel equidistant short axis cross-sections from base to apex were obtained from the reconstructed LV. In 15² intervals 24 wall thickness measurements in each cross-section were made at end-diastole (ED) and end-systole (ES). A total of 240 measurements were obtained in each patient. Wall thickening, a parameter of systolic function, was calculated as difference of ES and ED wall thickness. The results are shown as mean ± SD.



Conclusions: Wall thickening is inversely related to ED thickness independent of the underlying heart condition. With marked LV hypertrophy, systolic function in HCM is more impaired than in HHD which may be partly due to a higher content of LV fibrosis in HCM.

950-72 Assessment of the Left Ventricular Outflow Tract in Hypertrophic Cardiomyopathy by Three-Dimensional Echocardiography

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The objective of this study was to analyze the alterations in size and geometry of the left ventricular outflow tract (LVOT) which occur in hypertrophic cardiomyopathy (HCM) using transthoracic three-dimensional echocardiography. At this aim, echocardiographic images from 90 consecutive cross-sections were digitally acquired (with ECG and respiratory gating) with the rotational approach (either from the parasternal or the apical view, at 2-degree interval) in 17 patients with HCM and in 10 normal subjects. After conversion and resampling of the images into a volumetric dataset, off-line short-axis parallel slicing (1-mm distance) of the LVOT was performed at the onset of systole. For each slice, the endocardial borders were manually traced, and cross sectional area (CSA), maximal (latero-medial) and minimal (antero-posterior) diameter were calculated. For each patient, the minimal LVOT CSA, the ratio between maximal and minimal CSA, and the ratio be-